

NAME :

Open book, open notes, open computer, but closed mouth!
Write all answers on these sheets.

question	1	2	3	4	5	6	7	total
points								
maximum	15	10	15	15	20	15	10	100

1. Consider the sum $\sum_{k \geq 1} \frac{1}{2^k - 1}$.

Give the Maple command to create a function to compute a numerical approximation of this sum. The function (call it `sNd`) must take two arguments:

- `N` : the number of terms in the sum; and
`d` : the number of digits in the approximation.

Do `sNd(20,100)`; and report the last digit you see.

/15

2. Explain what the command `map` does. Give an example of a good use.

/10

3. The n -th Chebychev polynomial is also often defined as $\cos(n \arccos(x))$.

Give the definition of the procedure `C` which takes on input x and has index n .

Thus `C[n](x)` returns $\cos(n \arccos(x))$ while `C[10](0.5)` returns the value of the 10-th Chebychev polynomial at 0.5. Compare this value with `orthopoly[T](10,0.5)`.

/15

4. What is the difference between `diff` and `D`?

Give an example where `diff` must be used instead of `D`:

Give an example where `D` must be used instead of `diff`:

/15

5. Let a and b be positive numbers. Consider $f = \frac{x^2}{a} + \frac{y}{b}$ and the unit circle $x^2 + y^2 = 1$.
Give all Maple commands . . .

(a) to determine the number of extremal values of f on the unit circle.

(b) to show how to compute one (only one!) such extremal value.

6. Consider the curve $x^4 - 3xy + y^4$. Give all Maple commands

(a) to make a plot for x and y both ranging between -2 and $+2$.

(b) to convert the curve into polar coordinates.

(c) to plot the curve in polar coordinates.

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7. The (i, j) -th entry in a Vandermonde matrix is defined as x_i^{j-1} .

Give the Maple command to make a 3-by-3 Vandermonde matrix.

/10